I claim:

1. A method of separating at least one target from a sample composition comprising:

contacting the sample composition with at least one reactive affinity molecule, said at least one reactive affinity molecule comprising at least one reactive functional group that reacts with the at least one target to form at least one adduct, wherein said reaction is a naturally reversible reaction comprising the formation of at least one covalent bond, and

wherein said at least one reactive affinity molecule is attached to at least one phase separating group.

2. The method of claim 1, wherein said at least one reactive functional group comprises at least one nitroso group and wherein said at least one target comprises at least one 1,3 diene.

3. The method as in claim 1, wherein said at least one reactive functional group comprises at least one aldehyde group and wherein said at least one target comprises at least one group chosen from alcohols, amines and thiols.

4. The method as in claim 1, wherein said at least one reactive functional group comprises at least one alkene substituted by the at least one anion stabilizing group, and wherein said at least one target comprises at least one group chosen from alcohols, amines and thiols.

5. The method as in claim 1, wherein said at least one reactive functional group comprises at least one ketone and wherein said at least one target comprises at least one group chosen from alcohols, amines and thiols.

6. The method as in claim 1, wherein said at least one reactive functional group comprises at least one iminium group and wherein said at least one target comprises at least one group chosen from alcohols, amines and thiols.

7. The method as in claim 1, wherein said at least one reactive functional group comprises at least one carboxylic acid ester and wherein said at least one target comprises at least one group chosen from alcohols, amines and thiols.

8. The method of claim 1, further comprising recovering said at least one target by contacting the at least one adduct with at least one eluant.

9. The method of claim 8, wherein said at least one eluant is chosen from a gas phase composition and a liquid phase composition.

10. The method of claim 8, wherein said at least one eluant is chosen from water, alcohols, hydrocarbons, and ethers.

11. The method of claim 10, wherein said alcohols are chosen from methanol, ethanol, propanol, isopropanol and butanol.

12. The method of claim 10, wherein said ethers are chosen from propyl ethers and butyl ethers.

13. The method of claim 10, wherein said hydrocarbons are chosen from benzene, toluene, xylenes, mesitylenes, hexanes, heptanes, octanes and nonanes.

14. The method of claim 1, further comprising changing the temperature of the at least one adduct.

15. The method of claim 14, further comprising recovering said at least one target by contacting the at least one adduct with at least one eluant.

16. The method of claim 14, further comprising recovering said at least one target by extraction.

17. The method of claim 1, further comprising contacting said at least one adduct with at least one eluant that changes the equilibrium constant of said reaction.

18. The method of claim 17, comprising exposing the at least one adduct to a change in at least one property chosen from polarity, temperature, and pH to change the equilibrium constant of said reaction.

19. The method of claim 17, further comprising recovering said at least one target by contacting the at least one adduct with at least one eluant.

20. The method of claim 1, further comprising contacting said at least one adduct with at least one reaction medium that changes the equilibrium constant of said reaction.

21. The method of claim 20, comprising exposing the at least one adduct to a change in at least one property chosen from polarity, temperature, and pH to change the equilibrium constant of said reaction.

22. The method of claim 20, wherein the at least one reaction medium is chosen from a gas phase medium and a liquid phase medium.

23. The method of claim 20, wherein at least one reaction medium is chosen from water, alcohols, hydrocarbons, and ethers.

24. The method of claim 20, wherein said alcohols are chosen from methanol, ethanol, propanol, isopropanol and butanol.

25. The method of claim 20, wherein said ethers are chosen from propyl ethers, ethyl ethers, butyl ethers, and mixed ethers

26. The method of claim 23, wherein said hydrocarbons are chosen from benzene, toluene, xylenes, mesitylenes, hexanes, heptanes, octanes and nonanes.

27. The method of claim 20, further comprising recovering said at least one target by extraction.

28. The method of claim 1, wherein said reaction occurs at a rate having a half-life of about 4 hours or less at 25^0C.

29. The method of claim 1, wherein said reaction is a naturally reversible reaction comprising the formation of at least two covalent bonds.

30. The method of claim 1, wherein said at least one phase separating group is attached to said at least one reactive affinity molecule through at least one method chosen from covalent bond, chemisorption and ion-paring.

31. The method of claim 1, wherein said at least one phase separating group is a solid.

32. The method of claim 31, wherein said solid is chosen from polymers, silicas, silica gels, aluminas, and carbon.

33. The method of claim 32, wherein said polymers are chosen from synthetic polymers and natural polymers.

34. The method of claim 32, wherein said polymers are chosen from macroreticular polymers, polyethers, polyamides, polyesters and polyenes..

35. The method of claim 34, wherein said polyenes are chosen from polyacrylates, macroreticular polyacrylates, polystyrenes, and macroreticular polystyrenes.

36. The method of claim 31, wherein said solid is a stationary phase of a chromatographic column.

37. The method of claim 1, wherein said at least one phase separating group comprises at least one group that imparts solubility in a liquid.

38. The method of claim 37, wherein the at least one group that imparts solubility in a liquid is at least one water solubilizing group.

39. The method of claim 38, wherein said at least one water solubilizing group is chosen from neutral groups, groups comprising at least one negative charge, groups comprising at least one positive charge, and groups comprising at least one negative charge and at least one positive charge.

40. The method of claim 38, wherein said at least one water solubilizing group is chosen from sulfates, sulfonates, phosphates, phosphonates, carboxylates, ammoniums, phophoniums, sulfoniums, polyhydridic alcohols, guanadiniums and polyethers.

41. The method of claim 37, wherein the at least one group that imparts solubility in a liquid imparts solubility in a water immiscible phase.

42. The method of claim 1, wherein the at least one reactive affinity molecule further comprises at least one reactivity modifier group.

43. The method of claim 42, wherein the at least one reactivity modifier group comprises at least one acidic group chosen from carboxylic acids, phenols, ammoniums, phosphates, phosphate esters, phosphonates, and phosphonate esters.

44. The method of claim 42, wherein the at least one reactivity modifier group comprises at least one basic group chosen from amines, heteroaryl amines, caboxylates, phenolates, phosphate anions, and phosphonate anions.

45. The method of claim 42, wherein said at least one reactivity modifier group is chosen from electron withdrawing groups and electron donating groups.

46. The method of claim 45, wherein said electron withdrawing groups are chosen from halogens, nitro groups, cyano groups, hydroxyl groups, alkoxy groups, fluoroalkyl groups, perfluoroalkyl groups, nitrile groups, carboxyl groups, carboxylic ester groups, amide groups, sulfoxide groups, sulfone groups, carbonyl groups and ammonium groups.

47. The method of claim 45, wherein the electron donating groups are chosen from hydroxyl groups, amine groups, monoalkylamine groups, dialkylamine groups, methoxy groups, ethoxy groups, hydroxyl groups and alkoxy groups.

48. The method of claim 42, wherein said at least one reactivity modifier group alters at least one property of the at least one reactive functional group chosen from electronic characteristics, steric availability, and chirality.

49. The method of claim 17, wherein the at least one reactive affinity molecule further comprises at least one reactivity modifier group and wherein the at least one eluant changes the equilibrium constant of said reaction by modifying the at least one reactivity modifier group.

50. The method of claim 1, wherein said at least one reactive affinity molecule further comprises at least one framework group.

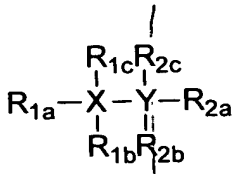
51. The method of claim 50, wherein said at least one framework group comprises at least two atoms.

52. The method of claim 50, wherein said at least one framework group comprises at least one group chosen from alkyl groups, aryl groups, and heteroaryl groups.

53. The method of claim 1, wherein said at least one reactive affinity molecule further comprises at least one reactivity modifier group and at least one at least one framework group.

54. The method of claim 1, wherein the at least one reactive functional group comprises at least one group chosen from N=N, C=C, C=O, N=O, C=N, C=S,and C≡C.

55. The method of claim 1, wherein the at least one reactive affinity molecule comprises at least one group of formula



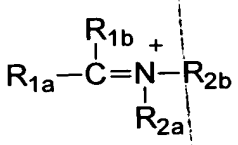
wherein $R1_a$, $R1_b$, $R1_c$ $R2_a$, $R2_b$ and $R2_c$ are each independently absent or are chosen from H, alkyl groups, aryl groups, heteroaryl groups, framework groups, reactivity modifier groups, framework groups with reactivity modifier groups, a direct bond between X and Y, and a direct bond to a phase separating group;

wherein X and Y are each independently chosen from C, O, N, and S, and wherein at least one of X and Y may have at least one positive or at least one negative charge;

and optionally wherein at least one of X and Y is bonded to at least one phase separating group.

56. The method of claim 55, wherein the at least one reactive affinity molecule comprises at least one group chosen from $R1_a(R1_b)C=C(R2_a)R2_b$, $R1_a(R1_b)C=O$, $R1_a(R1_b)C=N\text{-}R2_a$, and $R1_a\text{-}N=O$.

57. The method of claim 1, wherein the at least one reactive affinity molecule comprises at least one group of formula

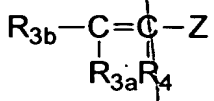


wherein $R1_a$, $R1_b$, $R2_a$, and $R2_b$ are each independently chosen from H, alkyl groups, aryl groups, heteroaryl groups, framework groups, reactivity modifier groups, framework groups with reactivity modifier groups and a direct bond to a phase separating group;

or wherein $R1_a(R1_b)C=N^+(R2_a)R2_b$ form a ring structure;

and wherein C is optionally bonded to at least one phase separating group.

58. The method of claim 1, wherein the at least one reactive affinity molecule comprises at least one group of formula

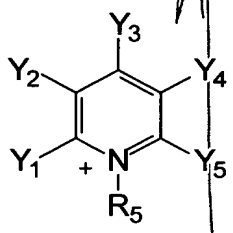


wherein $R3_a$, $R3_b$ and R_4 are each independently chosen from H, alkyl groups, aryl groups, heteroaryl groups, framework groups, reactivity modifier groups, framework groups with reactivity modifier groups and a direct bond to at least one phase separating group; and

wherein Z comprises at least one anion stabilizing group.

59. The method of claim 58, wherein Z is chosen from nitro groups, ketones, esters, amides, sulfoxides, sulfones, nitriles, iminiums and phosphoniums.

60. The method of claim 1, wherein the at least one reactive affinity molecule comprises at least one group of formula

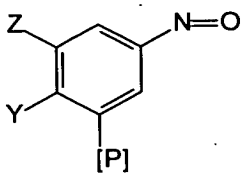


wherein R_5 is chosen from H, alkyl groups, aryl groups, heteroaryl groups, framework groups, reactivity modifier groups, framework groups with reactivity modifier groups and a direct bond to at least one phase separating group; and

wherein Y_1, Y_2, Y_3, Y_4, and Y_5 are each independently chosen from H, alkyl groups, aryl groups, heteroaryl groups, framework groups, reactivity modifier groups, framework groups with reactivity modifier groups and a direct bond to at least one phase separating group.

61. The method of claim 1, wherein said at least one target is chosen from ergosterol, thebaine, and vitamin D.

62. A method for isolating at least one thebaine from a sample composition, comprising contacting the sample composition with at least one reactive affinity molecule chosen from:



wherein Z and Y are each independently chosen from H, alkyl groups, aryl groups, heteroaryl groups, framework groups, reactivity modifier groups, and framework groups with reactivity modifier groups; and

wherein [P] is a phase separating group.

63. A chromatographic resin comprising

at least one reactive affinity molecule that comprises at least one reactive functional group,

wherein said at least one reactive functional group reacts with at least one target to form at least one adduct, wherein said reaction is a naturally reversible reaction comprising the formation of at least one covalent bond.

64. The chromatographic resin of claim 63, wherein said at least one reactive affinity molecule further comprises at least one reactivity modifying group.

65. The chromatographic resin of claim 63, wherein said at least one reactive affinity molecule further comprises at least one framework group.

66. The chromatographic resin of claim 63, wherein said at least one reactive functional group comprises at least one N=O and wherein said at least one target comprises at least one 1,3 diene.

67. The chromatographic resin of claim 63, wherein said reactive functional group comprises at least one group chosen from C=O, C=NR, C=C and RO-C=O,

wherein R is chosen from H, alkyl groups, aryl groups, and heteroaryl groups and said at least one target comprises at least one group chosen from alcohols, amines, and thiols.

68. An apparatus, comprising

at least one chromatographic column that comprises at least one reactive affinity molecule,

wherein said at least one reactive affinity molecule comprises at least one reactive functional group that reacts with at least one target to form at least one adduct, wherein said reaction is a naturally reversible reaction comprising the formation of at least one covalent bond.

69. The apparatus of claim 68, wherein said at least one reactive affinity molecule further comprises at least one reactivity modifying group.

70. The apparatus of claim 68, wherein said at least one reactive affinity molecule further comprises at least one framework group.

71. A method of separating at least one target from a sample composition, comprising

adding a water immiscible solution comprising said sample composition to an aqueous solution comprising at least one reactive affinity molecule

wherein said at least one reactive affinity molecule comprises at least one water solubilizing group and at least one reactive functional group

wherein said at least one reactive functional group reacts with the at least one target to form at least one water soluble adduct, wherein said reaction is a naturally reversible reaction comprising the formation of at least one covalent bond;

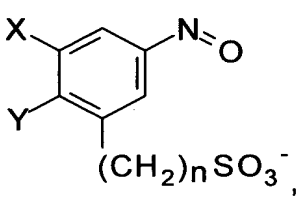
allowing the water immiscible solution and the aqueous solution to separate;

and recovering said at least one target from the aqueous solution by extraction.

72. The method of claim 71, wherein said at least one target is recovered by changing the equilibrium constant of said reaction before extraction.

73. The method of claim 72, comprising exposing the at least one water soluble adduct to a change in at least one property chosen from polarity, temperature, and pH to change the equilibrium constant of said reaction.

74. The method of claim 71, wherein said reactive affinity molecule is chosen from



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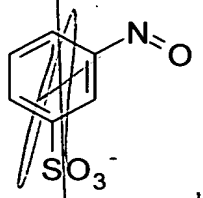

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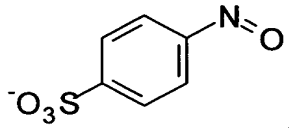

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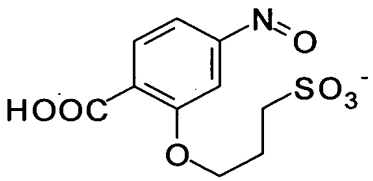

wherein X and Y are chosen from H, alkyl groups, aryl groups, heteroaryl groups, and reactivity modifying groups,

and wherein said at least one target comprises at least one 1,3-diene.

75. A composition comprising

at least one reactive affinity molecule that comprises at least one reactive

functional group,

wherein the at least one reactive functional group reacts with at least one target to form at least one adduct, wherein said reaction is a naturally reversible reaction comprising the formation of at least one covalent bond; and

at least one phase separating group that imparts solubility of said composition in a liquid phase.

76. The composition of claim 75, wherein said liquid phase is an aqueous phase.

77. The composition of claim 75, wherein said at least one reactive affinity molecule further comprises at least one reactivity modifying group.

78. The composition of claim 75, wherein said at least one reactive affinity molecule further comprises at least one framework group.